Finding Extreme Points: Takeaways

Concepts

- A derivative is the slope of the tangent line at any point along a curve.
- Let be a point on the curve and be the distance between two points, then the mathematical formula for the slope as h approaches zero is given as:

- Differentiation is the process of finding a function's derivative.
- Finding the derivative of: :
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- Three ways of notating a curve's derivative:
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  - *Only use if derivative is a function
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- A critical point is a point where the slope changes direction from negative slope to positive slope or vice-versa. Critical points represent extreme values, which can be classified as a minimum or extreme value.
- Critical points are found by setting the derivative function to and solving for
- Critical point classification:
  - When the slope changes direction from positive to negative it can be a maximum value.
  - When the slope changes direction from negative to positive, it can be a minimum value.
  - If the slope doesn't change direction, like at for , then it can't be a minimum or maximum value.

- Each maximum or minimum value points are known as local extrema.
- Classifying local extrema:
    - A point is a relative minimum if a critical point is the lowest point in a given interval.
    - A point is a relative maximum if a critical point is the highest point in a given interval.
- Instead of using the definition of the derivative, we can apply derivative rules to easily calculate the derivative functions.
- Derivative rules:
    - Power rule: Let be some power, then
        - Example: Let In our function, would be 2. Using the power rule, it's derivative would be or
    - Sum rule:
        - Example:
    - Constant factor rule:
- Derivative of is always and derivative of is always .
- Once you found the critical points of a function, you can analyze the direction of the slope around the points using a sign chart to classify the point as a minimum or maximum. We can test points around our points of interest to see if there is a sign change as well as what the change is.

Resources

- Derivative rules
- Sign chart